CHROMOSOME STUDIES IN MEXICAN COMPOSITAE[1]

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The chromosome numbers reported in this paper are, for the greater part, based upon specimens collected during the summer of 1961 along with material for the authors' separate monographic studies of the genera *Astranthium* (Compositae-Astereae) and *Sabazia* (Compositae-Heliantheae). Bud collections were obtained from plants growing in their native habitats and were placed in vials containing a freshly mixed Carnoy solution of 6 parts 95% ethyl alcohol, 3 parts chloroform, and 1 part glacial acetic acid. The vials were subsequently placed in a foam-plastic cooler with bulk ice and kept refrigerated during the entire field trip; upon return to East Lansing they were stored at 1° C until used. Slides were made by the aceto-carmine smear technique. Chromosomes were drawn with the aid of a Zeiss drawing apparatus at an initial magnification of ca. 4000X and are here reduced to ca. 1300X.

A complete list of the taxa studied is contained in Table 1; the tribal sequence is that of Hoffmann (1897), whereas the genera and species have been placed in alphabetical order. All counts are documented by voucher specimens in the Herbarium of Michigan State University. We are indebted to Dr. J. H. Beaman for aid in the identification of certain specimens and in the preparation of the manuscript, and to Dr. Rogers McVaugh for the use of herbarium facilities at the University of Michigan, Ann Arbor. Dr. Arthur Cronquist kindly identified some species of *Erigeron* and *Conyza;* Drs. B. L. Turner and M. C. Johnston determined the species of *Aphanostephus, Dyssodia,* and *Schkuhria.* All other determinations are our own.

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TABLE 1.

SUMMARY OF THE COLLECTIONS STUDIED.

TAXON	LOCALITY	GAMETIC CHROMOSOME NUMBER
EUPATORIEAE		
Eupatorium greggii Gray	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 951.*	10 (Fig. 1)
Kuhnia chlorolepis Woot. & Standl.	CHIHUAHUA: 11 mi. e. of Majalca. *De Jong & Longpre 924.*	9 (Fig. 2)
ASTEREAE		
Achaetogeron forreri Greene	DURANGO: at railroad crossing near Hacienda Coyotes. *De Jong & Longpre 1003.*	27 (Fig. 3)
A. griseus Greenman	DURANGO: 30 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 974.*	9
A. griseus	DURANGO: 31 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 978.*	9 (Fig. 4)
Aphanostephus ramosissimus DC.	CHIHUAHUA: along Hwy to Buenaventura, 7 mi. w. of Hwy 45 turnoff. *De Jong & Longpre 904.*	4 (Fig. 5)
A. ramosissimus	CHIHUAHUA: 15 mi. w. of Buenaventura. *De Jong & Longpre 916.*	4
A. ramosissimus	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 961.*	4
A. ramosus (DC.) Gray	PUEBLA: 1.5 mi. w. of Chachapa. *Beaman 3614.*	4
A. ramosus	MICHOACAN: meadow along road to Cerro San Andres, 2815 m. alt. *De Jong 758.*	4
A. ramosus	MICHOACAN: At Km. 43.5, Hwy 120 to Uruapan. *De Jong 762.*	4
A. ramosus	PUEBLA: 3.4 mi. s. of Tlachichupa on road to Zuapam. *Beaman 3621.*	4
Aster pauciflorus Nutt.	DURANGO: *ca.* 12 mi. n. of Donato Guerra. *De Jong & Longpre 964.*	9 (Fig. 6)
A. exilis Ell. var. *australis* Gray	JALISCO: 13 mi. s. of Guadalajara. *De Jong & Longpre 1018.*	5
Astranthium mexicanum (Gray) Larsen	STATE OF MEXICO: At Km. 75, Amecameca—Popocatépetl road, 3235 m. alt. *De Jong 566.*	18

A. mexicanum	FEDERAL DISTRICT: near railroad overpass at La Cima. *De Jong 647.*	18	
A. mexicanum	FEDERAL DISTRICT: on slope along road to La Cima. *De Jong 653.*	18	
A. mexicanum	MICHOACAN: Cerro San Andres, *ca.* 3100 m. alt. *De Jong 757.*	18	
A. mexicanum	MICHOACAN: East slope of Cerro Tancitaro, 3080 m. alt. *De Jong 1068.*	18	
A. orthopodum (Robins. & Fern.) Larsen	DURANGO: 38 mi. w. of Ciudad Durango, along Hwy 40. *De Jong 984.*	3	(Fig. 7)
A. purpurascens (Robins.) Larsen	HIDALGO: at village limit of Cobrecito. *De Jong 1227.*	8	
A. xanthocomoides (Less.) Larsen	PUEBLA: 5.3 mi. sw. of San Salvador El Seco. *De Jong 630.*	8	(Fig. 8)
A. xanthocomoides	TLAXCALA: 2.2 mi. s. of Puebla State Line, just n. of Tlaxco. *De Jong 1195.*	8	
A. xylopodum Larsen	JALISCO: Sierra del Halo, s. of Tecalitlan. *De Jong 1028.*	5	(Fig. 9)
Baccharis glutinosa Pers.	CHIHUAHUA: 11 mi. e. of Majalca. *De Jong & Longpre 925.*	9	
Conyza canadensis (L.) Cronq.	CHIHUAHUA: along Hwy to Buenaventura, 7 mi. w. of Hwy 45 turnoff. *De Jong & Longpre 903.*	9	
C. aff. *confusa* Cronq.	DURANGO: 1 mi. e. of La Ciudad. *De Jong & Longpre 1011.*	9	(Fig. 10)
Erigeron coronarius Greene	DURANGO: 38 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 994.*	9	
E. aff. *coronarius*	DURANGO: 14 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 973.*	9	
E. delphinifolius Willd.	STATE OF MEXICO: 4.5 kms. s. of Tlalmanalco. *Beaman 4525.*	9	(Fig. 11)
E. delphinifolius Willd. aff. subsp. *neomexicanus* (Gray) Cronq.	DURANGO: *ca.* 12 mi. n. of Donato Guerra. *De Jong & Longpre 967.*	9	
E. delphinifolius Willd. subsp. *neomexicanus* var. *neomexicanus*	DURANGO: 14 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 972.*	9	

E. delphinifolius Willd. subsp. *neomexicanus* var. *oreophilus* (Greenman) Cronq.	CHIHUAHUA: 1 mi. e. of Majalca. *De Jong & Longpre 934.*	9	
E. divergens T. & G.	CHIHUAHUA: 11 mi. e. of Majalca. *De Jong & Longpre 922.*	9	(Fig. 12)
E. pubescens HBK.	HIDALGO: 3 mi. s. of Cuyamaloya. *De Jong & Longpre 1226.*	35 univalents	(Fig. 13)
Grindelia oxylepis Greene	CHIHUAHUA: 6 mi. w. of Cuaohtemoc. *De Jong & Longpre 940.*	6	
G. oxylepis	CHIHUAHUA: 22 mi. s. of Hidalgo del Parral. *De Jong & Longpre 948.*	6	
G. oxylepis	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 956.*	6	
G. sublanuginosa Steyermark	JALISCO: Lago Chapala, 49 mi. s. of Guadalajara. *De Jong & Longpre 1026.*	6	(Fig. 14)
Haplopappus spinulosus (Pursh) DC. subsp. *scabrellus* (Greene) Hall	CHIHUAHUA: along Hwy to Buenaventura, 7 mi. w. of Hwy 45 turnoff. *De Jong & Longpre 901.*	4	
H. spinulosus (Pursh) DC. subsp. *scabrellus*	CHIHUAHUA: 17 mi. n. of Ciudad Camargo. *De Jong & Longpre 919.*	6	
Leucelene ericoides (Torr.) Greene	CHIHUAHUA: 17 mi. n. of Ciudad Camargo. *De Jong & Longpre 920.*	8	(Fig. 15)
Machaeranthera tanacetifolia (HBK.) Nees	CHIHUAHUA: along Hwy to Buenaventura, 7 mi. w. of Hwy 45 turnoff. *De Jong & Longpre 900.*	4	
M. gymnocephala (DC.) Shinners	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 955.*	4	(Fig. 16)
Psilactis asteroides Gray	CHIHUAHUA: 6 mi. w. of Cuaohtemoc. *De Jong & Longpre 944.*	4	
Xanthocephalum gymnospermoides (Gray) Benth. & Hook. ex Rothrock in Wheeler	CHIHUAHUA: meadows at Majalca. *De Jong & Longpre 930.*	6	(Fig. 17)
X. gymnospermoides	CHIHUAHUA: 6 mi. w. of Cuaohtemoc. *De Jong & Longpre 943.*	6	
X. sericocarpum Gray	CHIHUAHUA: 9 mi. s. of V. Matamoros. *De Jong & Longpre 950.*	4	(Fig. 18)

INULEAE			
Gnaphalium lavanduli-folium (HBK.) Blake	STATE OF MEXICO: Nevado de Toluca, *ca.* 4090 m. alt. *De Jong & Longpre 1116.*	14	(Fig. 19)
HELIANTHEAE			
Berlandiera lyrata Benth.	CHIHUAHUA: along Hwy to Buenaventura, 3.6 mi. e. of Ricardo Flores Magon. *De Jong & Longpre 910.*	15	
Calea palmeri Gray	MICHOACAN: 12 mi. e. of Zacapu. *Longpre 113.*	16	
C. scabra (Lag.) Robins.	JALISCO: Sierra del Halo, s. of Tecalitlan. *De Jong 1033.*	16	(Fig. 20)
Cosmos palmeri Robins. var. *palmeri*	DURANGO: 33 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 983.*	17	(Fig. 21)
Chrysanthellum mexicanum Greenman	JALISCO: 13 mi. s. of Guadalajara. *De Jong & Longpre 1020.*	8	(Fig. 22)
Parthenium hysterophorus L.	DURANGO: *ca.* 12 mi. n. of Donato Guerra. *De Jong & Longpre 965.*	17	
P. hysterophorus	JALISCO: 13 mi. s. of Guadalajara. *De Jong & Longpre 1021.*	17	
Sabazia humilis (HBK.) Cass.	PUEBLA: between Kms. 65 and 66, Hwy 190, se. of Mexico City. *Longpre 350A.*	4	(Fig. 23)
Sanvitalia procumbens Lam.	DURANGO: *ca.* 12 mi. n. of Donato Guerra. *De Jong & Longpre 966.*	8	(Fig. 24)
Verbesina tetraptera Gray	MICHOACAN: 12 mi. e. of Zacapu. *Longpre 127.*	*ca.* 18	
V. callilepis Blake	DURANGO: 1 mi. w. of La Ciudad. *De Jong & Longpre 1012.*	18	(Fig. 25)
Ximenesia encelioides Cav.	CHIHUAHUA: along Hwy to Buenaventura, 9.2 mi. w. of Ricardo Flores Magon. *De Jong & Longpre 911.*	17	(Fig. 26)
Zexmenia palmeri Greenman in Jones	MICHOACAN: 12 mi. e. of Zacapu. *Longpre 128.*	*ca.* 17	
HELENIEAE			
Dyssodia cancellata (Cass.) Gray	CHIHUAHUA: 9 mi. s. of V. Matamoros. *De Jong & Longpre 949.*	13	(Fig. 27)
D. hartwegii (Gray) Robins	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 957.*	26	(Fig. 28)

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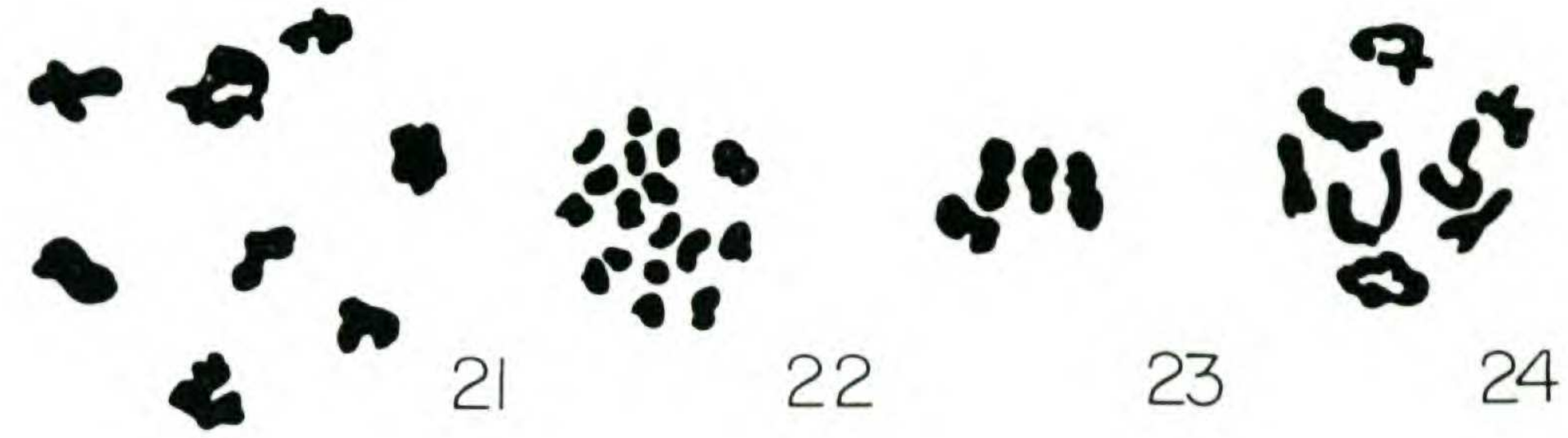
Gaillardia pinnatifida Torr.	CHIHUAHUA: 17 mi. n. of Ciudad Camargo. *De Jong & Longpre 914.*	17	
Psilostrophe gnaphalodes DC.	DURANGO: 1 mi. s. of La Zarca. *De Jong & Longpre 954.*	32	(Fig. 29)
P. tagetina (Nutt.) Greene	CHIHUAHUA: along Hwy to Buenaventura, 7 mi. w. of Hwy 45 turnoff. *De Jong & Longpre 905.*	16	(Fig. 30)
Schkuhria anthemoidea (DC.) Coult. var. *wislizeni* (Gray) Heiser	JALISCO: Lago de Chapala, 49 mi. s. of Guadalajara. *De Jong & Longpre 1024.*	10	(Fig. 31)
Tagetes lucida Cav.	CHIHUAHUA: 3 mi. w. of Guerrero. *De Jong & Longpre 947.*	11	(Fig. 32)
ANTHEMIDEAE			
Achillea lanulosa Nutt.	CHIHUAHUA: meadows at Majalca. *De Jong & Longpre 932.*	18	
SENECIONEAE			
Cacalia sinuata Llav. & Lex.	DURANGO: 33 mi. w. of Ciudad Durango, along Hwy 40. *De Jong & Longpre 982.*	30	
MUTISIEAE			
Chaptalia dentata (L.) Cass.	DURANGO: 14.5 mi. w. of Hacienda Coyotes. *De Jong & Longpre 1008.*	16	(Fig. 33)
CICHORIEAE			
Stephanomeria pauciflora (Torr.) A. Nels.	CHIHUAHUA: 17 mi. n. of Ciudad Camargo. *De Jong & Longpre 915.*	8	(Fig. 34)
S. tenuifolia (Torr.) Hall	CHIHUAHUA: 11 mi. e. of Majalca. *De Jong & Longpre 927.*	8	(Fig. 35)

Fig. 1-20. Meiotic chromosomes of Mexican Compositae, × *ca.* 1300. Fig. 1. *Eupatorium greggii* ($n = 10$) — Fig. 2. *Kuhnia chlorolepis* ($n = 9$) — Fig. 3. *Achaetogeron forreri* ($n = 27$) — Fig. 4. *Achaetogeron griseus* ($n = 9$) — Fig. 5. *Aphanostephus ramosissimus* ($n = 4$) — Fig. 6. *Aster pauciflorus* ($n = 9$) — Fig. 7. *Astranthium orthopodum* ($n = 3$) — Fig. 8. *Astranthium xanthocomoides* ($n = 8$) — Fig. 9. *Astranthium xylopodum* ($n = 5$) — Fig. 10. *Conyza* aff. *confusa* ($n = 9$) — Fig. 11. *Erigeron delphinifolius* ($n = 9$) — Fig. 12. *Erigeron divergens* ($n = 9$) — Fig. 13. *Erigeron pubescens* ($n = 35$ univalents) — Fig. 14. *Grindelia sublanuginosa* ($n = 6$) — Fig. 15. *Leucelene ericoides* ($n = 8$) — Fig. 16. *Machaeranthera gymnocephala* ($n = 4$) — Fig. 17. *Xanthocephalum gymnospermoides* ($n = 6$) — Fig. 18. *Xanthocephalum sericocarpum* ($n = 4$) — Fig. 19. *Gnaphalium lavandulifolium* ($n = 14$) — Fig. 20. *Calea scabra* ($n = 16$).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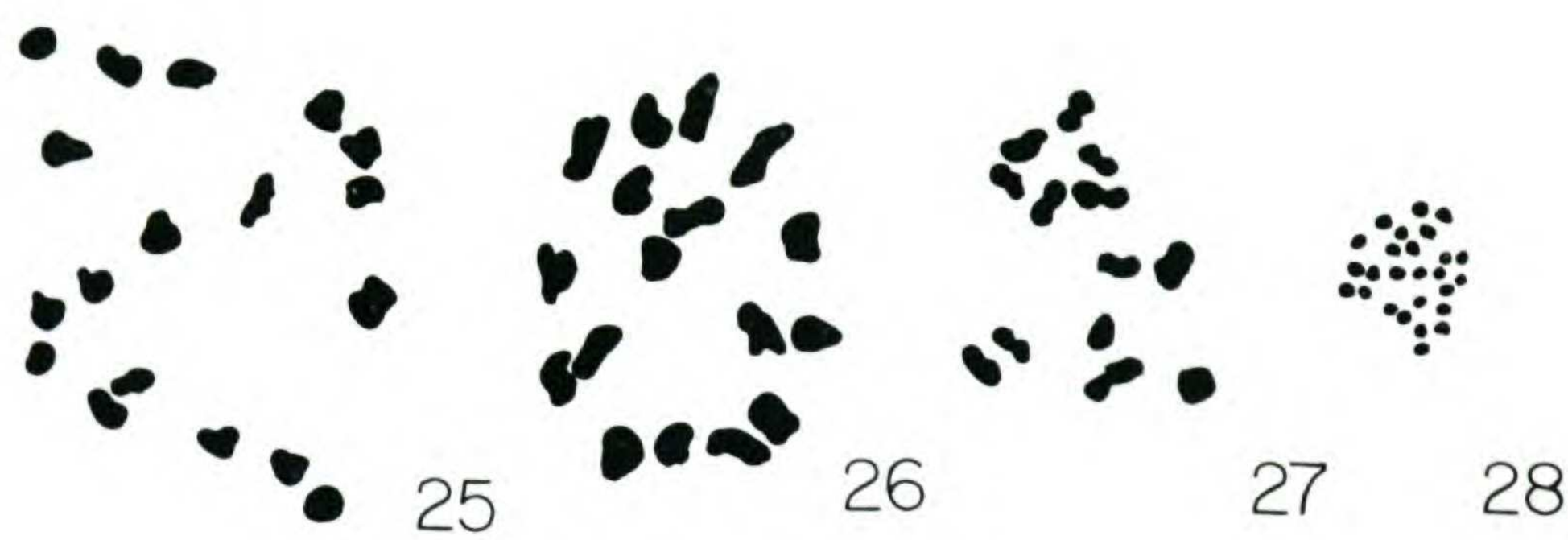
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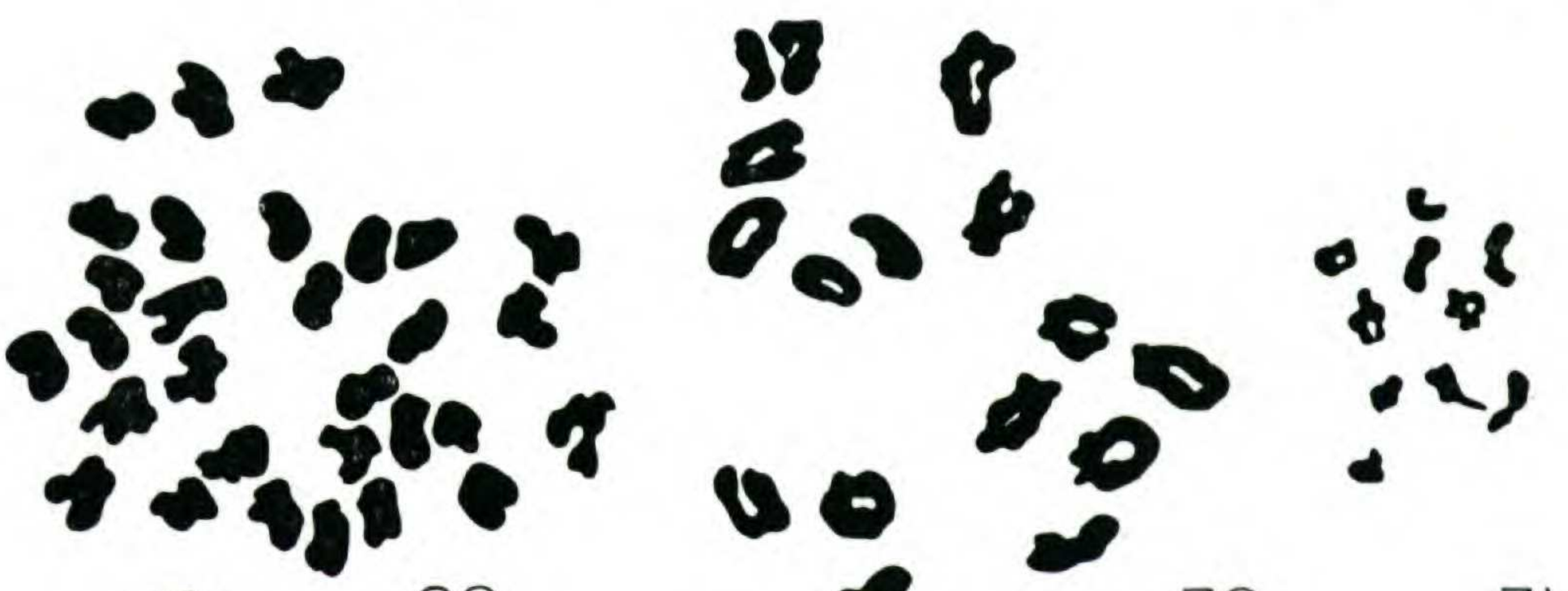
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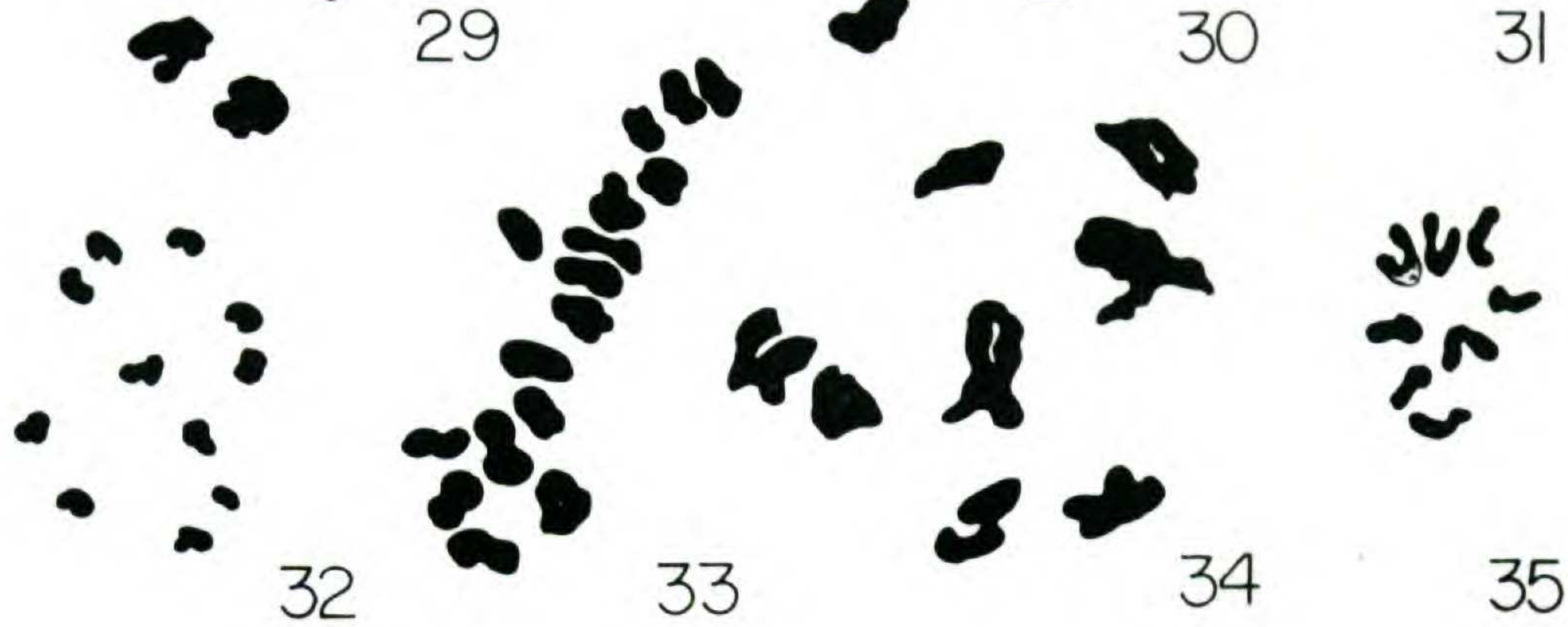
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DISCUSSION

EUPATORIEAE — *Eupatorium.* Most species counted to date are members of sect. Eximbricata. *E. greggii* ($n = 10$) is a member of sect. Conoclinium, in which another species, *E. betonicum,* has also been counted as $n = 10$ by Turner, Powell, and King (1962). *Eupatorium* sect. Conoclinium has close affinities with *Ageratum* which is unibasic on $x = 10$.

Kuhnia chlorolepis ($n = 9$). This species was also reported as $n = 9$ by Turner (1959).

ASTEREAE — *Achaetogeron* ($x = 9$). The chromosome numbers reported for *A. forreri* ($n = 27$) and *A. griseus* ($n = 9$) are the first counts for this primarily Mexican genus.

In the description of *A. wislizeni,* the species upon which *Achaetogeron* was based, Gray (1849) noted it to be ". . . entirely like a true Erigeron . . . except as to the pappus which refers it to the Bellideae . . ." Thus *Achaetogeron* was established by Gray to accommodate a species characterized by a simple pappus of small setae and without the inner pappus bristles found in *Erigeron.* In addition to *A. wislizeni,* 20 species have been described in *Achaetogeron* by subsequent authors.

In *Achaetogeron* we can distinguish three groups of species on the basis of pappus characters. One group, including the type species of the genus, has a simple pappus of short setae or squamellae. The second is epappose; the third has a double pappus of inner bristles and an outer crown of setae

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Fig. 21-35. Meiotic chromosomes of Mexican Compositae, × *ca.* 1300. Fig. 21. *Cosmos palmeri* var. *palmeri* ($n = 17$) — Fig. 22. *Chrysanthellum mexicanum* ($n = 8$) — Fig. 23. *Sabazia humilis* ($n = 4$) — Fig. 24. *Sanvitalia procumbens* ($n = 8$) — Fig. 25. *Verbesina callilepis* ($n = 18$) — Fig. 26. *Ximenesia encelioides* ($n = 17$) — Fig. 27. *Dyssodia cancellata* ($n = 13$) — Fig. 28. *Dyssodia hartwegii* ($n = 26$) — Fig. 29. *Psilostrophe gnaphalodes* ($n = 32$) — Fig. 30. *Psilostrophe tagetina* ($n = 16$) — Fig. 31. *Schkuhria anthemoidea* var. *wislizeni* ($n = 10$) — Fig. 32. *Tagetes lucida* ($n = 11$) — Fig. 33. *Chaptalia dentata* ($n = 16$) — Fig. 34. *Stephanomeria pauciflora* ($n = 8$) — Fig. 35. *Stephanomeria tenuifolia* ($n = 8$).

or squamellae. Most of the species of this third group were described by Larsen (1948). Since the double pappus is also found in the majority of species of *Erigeron* and since this third group of species is like *Erigeron* in all other characters, there seems to be no reason to retain these species in *Achaetogeron*. To this effect it should be noted that we have found *Achaetogeron fisheri* Larsen to be conspecific with *Erigeron delphinifolius*. On this basis we hesitate at present to effect the transfers of these species without a careful study of the Mexican species of *Erigeron*.

With respect to the remaining species of *Achaetogeron*, their generic status has been questioned by several workers. In fact, Greene (1891) considered the genus to be artificial and transferred the species then known to *Erigeron*. Our studies have so far indicated that *Achaetogeron* is somewhat heterogeneous and that some species have such close relatives in *Erigeron*, that they may be placed with these species in *Erigeron*, without affecting the naturalness of that genus. The basic chromosome number of *Achaetogeron* ($x = 9$) further supports the close relationship with *Erigeron* which has also $x = 9$; further morphological and cytological studies will be carried out on the Mexican species of both genera.

The chromosome numbers listed for *Aphanostephus* and *Aster* agree with the basic numbers reported for these genera by other workers. The count for *Aster pauciflorus* ($n = 9$), a member of sect. *Orthomeris*, is a first report.

Astranthium ($x = 3, 4, 5$). The counts for *A. orthopodum* ($n = 3$), *A. xylopodum* ($n = 5$), and that reported by Baldwin (1941) for *A. integrifolium* ($n = 4$) establish $x = 3$, 4, and 5 as the basic chromosome numbers of this predominantly Mexican genus which is a member of the subtribe Bellidinae. Of the eleven genera placed in this subtribe by Hoffmann (1897), five (excluding *Keerlia* which is now in *Chaetopappa*) are not yet known chromosomally. Of the remaining genera, *Achaetogeron*, *Bellis*, and *Lagenophora* have $x = 9$; the Australian *Brachycome* likewise has $x = 9$ (De Jong, unpublished). The genus *Aphanostephus*, like

Astranthium, is tribasic with $x = 3$, 4, and 5 (Turner in Raven *et al.*, 1960).

A. mexicanum ($n = 18$). Diploid and tetraploid counts were published previously for this species by Beaman, De Jong, and Stoutamire (1962). *A. mexicanum* is found at alpine and subalpine elevations in the transvolcanic belt of South-Central Mexico and extends southward into the State of Oaxaca. The species is anomalous in the genus in that it has morphological characters commonly found in *Achaetogeron*, while, cytologically, it agrees with the basic number of that genus.

A. xanthocomoides ($n = 8$). A count of $n = 8$ was also obtained for this species by Turner, Beaman, and Rock (1961). These authors likewise reported a second collection from Nuevo Leon to have $n = 8$, but this collection, *Beaman 2697*, should be regarded as an undescribed species of *Achaetogeron*. In view of the basic chromosome number of this genus, $x = 9$, it seems that a recount is in order for collection *2697*. *A. xanthocomoides*, as understood at present, has its northern limit in the Sierra de Pachuca in the State of Hidalgo (De Jong, unpublished).

Erigeron ($x = 9$). The chromosome numbers of the species listed in Table 1 are consistent with the basic chromosome number of the genus (cf. Montgomery and Yang, 1960).

E. delphinifolius ($n = 9$). This collection *(Beaman 4525)* was obtained from near the type locality of *Achaetogeron fisheri* (cf. discussion of *Achaetogeron*).

E. pubescens. We found 35 univalents in most cells examined, whereas cells in which a few bivalents were formed were rare. Pollen was found to be extremely variable in size, with a high percentage of the grains aborted. Turner, Beaman, and Rock (1961) reported another collection of this species with 36 univalents.

E. divergens ($n = 9$). We have found this species to be diploid, whereas *E. divergens* var. *cinereus* was reported by Montgomery and Yang (1960) to have $2n = 27$.

The counts listed for *Grindelia* are consistent with the

basic number of the genus. The chromosome number of *G. sublanuginosa* ($n = 6$) has not been reported before.

Haplopappus. Raven *et al.* (1960) indicated a collection of *H. spinulosis* subsp. *scabrellus* from Arizona to have $n = 4$. We have found $n = 4$ and $n = 6$ in two Chihuahuan collections of this subspecies. Jackson (1957a) likewise obtained $n = 4$ and $n = 6$ in *H. spinulosis* subsp. *cotula*.

Leucelene ($x = 8$). *L. ericoides* ($n = 8$); a count of $n = 16$ was published (cited as *Aster hirtifolius*) by Raven *et al.* (1960). This widespread, weedy perennial apparently has diploid and tetraploid races, which may account for the polymorphic nature of the species. We have followed Shinners (1946) in recognizing this monotypic genus which seems to have closer affinities with *Chaetopappa* than with *Aster*.

Xanthocephalum ($x = 4, 6$). The count here reported for *X. sericocarpum* ($n = 4$) brings to 4 the number of species in the genus that have this chromosome number. On the other hand, *X. gymnospermoides* has $n = 6$, as reported by various authors (Raven *et al.*, 1960; Turner, Powell, and King, 1962; see also Table 1). Three of the 8 species recognized by Solbrig (1961) are not yet known cytologically.

The chromosome numbers listed for species of *Baccharis*, *Conyza*, *Machaeranthera*, and *Psilactis* are consistent with the basic numbers reported for these genera (cf. Raven *et al.*, 1960; Turner, Powell, and King, 1962).

INULEAE — *Gnaphalium* ($x = 7$). The count ($n = 14$) for *G. lavandulifolium*, a suffrutescent alpine species, has not been previously reported. Another alpine species, *G. vulcanicum*, was also found to be tetraploid by Beaman, De Jong, and Stoutamire (1962).

HELIANTHEAE — *Berlandiera lyrata* ($n = 15$). Our count agrees with that published by Turner, Powell, and King (1962).

Calea ($x = 16, 18$). We have found both *C. palmeri* and *C. scabra* to have $n = 16$. Previous counts in the genus were reported by Turner, Powell, and King (1962), but an unequivocal count was only obtained for *C. trichotoma* ($n =$

18) by these authors. Bentham (1873) observed that some species of *Calea* were difficult to distinguish from species of *Sabazia*. Indeed, the herbaceous *C. palmeri* closely resembles *Sabazia* in floral and vegetative characters and may well be a member of that genus. Our count for *C. scabra* ($n = 16$) adds a second basic number to *Calea*.

Cosmos ($x = 12, 17$). Of the 27 species recognized in the genus by Sherff (1955), only 4 species have so far been counted. From all reported chromosome numbers, the genus has appeared to be unibasic with $x = 12$. We have found *C. palmeri* var. *palmeri* to have $n = 17$ and are considering it to be diploid on a base of $x = 17$.

Chrysanthellum ($x = 8$). The chromosome number of *C. mexicanum* ($n = 8$) is the first report for this genus of 2 or 3 small annual species which Hoffmann (1897) placed in the subtribe Coreopsidinae. A species of *Heterospermum*, a genus which Bentham (1873) considered to be closely related to *Chrysanthellum*, was counted as $n = 25$ by Turner, Beaman, and Rock (1961).

Parthenium. Our counts for two collections of *P. hysterophorus* ($n = 17$) agree with those reported by Rollins (1950) for the same species. On the other hand, Thombre (1959) found *P. hysterophorus* to have $n = 18$. Since some other species in the genus have been reported as $n = 18$, the problem here appears to be taxonomic rather than cytological.

Sabazia ($x = 4$). Our count for *S. humilis* ($n = 4$) is consistent with that of Turner and Johnston (1961). *S. humilis* is an annual species and has the lowest chromosome number so far found in the genus (Longpre, unpublished). Although Hoffmann (1897) considered *Sabazia* to be a member of the subtribe Verbesininae, we agree with Turner and Johnston (1961) that the genus is better placed in the subtribe Galinsoginae. Turner and Johnston thought the genus to have affinities with *Tridax;* we are of the opinion that *Sabazia* is also close to *Galinsoga*, morphologically as well as chromosomally.

Verbesina. The chromosome number of *V. callilepis*, $n =$

18, has not been previously reported. The species is a member of sect. *Pterophyton.*

Ximenesia ($x = 17$). *X. encelioides* ($n = 17$). Previous counts of $n = 17$ were reported by Carlquist (1954, as *Verbesina encelioides*) and Turner and Ellison (1960). *X. encelioides* is the only species so far counted in this small genus which Hoffmann (1897) considered to be a section of *Verbesina.*

Zexmenia. Jones (1905) recognized 42 species in this genus, the greater number of which is found in Mexico and Central America. Turner, Powell, and King (1962) considered the genus to be multibasic with $x = 10$, 11, and 14. Since our count for *Z. palmeri* is an approximation, ($n =$ *ca.* 17), no conclusion is warranted concerning its bearing on the basic chromosome numbers of the genus.

HELENIEAE — *Psilostrophe* ($x = 16$). *P. gnaphalodes* ($n = 32$) seems to have diploid and tetraploid races, since Turner, Beaman, and Rock (1961) counted the species as $n = 16$. Our count for *P. tagetina* ($n = 16$) agrees with that reported for the same species by Jackson (1957b), and Raven and Kyhos (1961).

Schkuhria ($x = 10$, 11). *S. anthemoidea* var. *wislizeni* ($n = 10$). Turner, Powell, and King (1962) reported this variety as tetraploid.

The chromosome numbers listed in Table 1 for species of *Dyssodia, Gaillardia,* and *Tagetes* are consistent with those previously obtained for the same species (cf. Johnston and Turner, 1962; Raven and Kyhos, 1961).

MUTISIEAE — *Chaptalia dentata* ($n = 16$). Chromosome numbers of $2n = 48$ have been reported by Baldwin and Speese (1947) for *C. nutans* var. *nutans* and *C. integrifolia,* and Turner (1959) obtained $n = 24$ for *C. nutans* var. *texana.* These authors considered $x = 12$ to be the basic number of the genus. Although the few genera studied in the Mutisieae have high basic chromosome numbers, our count for *C. dentata* suggests that $x = 8$, rather than 12, is the basic number of *Chaptalia.*

CICHORIEAE — *Stephanomeria* ($x = 8$). Our counts for *S. pauciflora* and *S. tenuifolia,* both with $n = 8$, agree with

the counts obtained by Stebbins, Jenkins, and Walters (1953) for the same species.

SUMMARY

This paper reports chromosome numbers in 74 collections, representing 57 taxa of Mexican Compositae; the chromosome numbers of 21 of these are reported for the first time including first counts for the genera *Achaetogeron* and *Chrysanthellum*. The generic status of *Achaetogeron* is discussed on the basis of morphological and cytological evidence; the genus is considered as provisionally distinct.

Basic chromosome numbers in addition to those previously obtained by other authors are reported for the genera *Astranthium*, *Calea*, and *Cosmos;* the basic number of *Chaptalia* is thought to be $x = 8$ rather than 12 as previously reported. Chromosome counts of *Haplopappus spinulosis* subsp. *scabrellus* ($n = 6$), *Leucelene ericoides* ($n = 8$), *Psilostrophe gnaphalodes* ($n = 32$), and *Schkuhria anthemoidea* var. *wislizeni* ($n = 10$) differ from those published earlier for these taxa.

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